

Art. 34

does not absorb microwaves at the ambient temperature and has to be activated in some way i.e. make it capable to absorb microwaves. It is also known that at certain temperature - about 500 °C and more the positively charged particles of alkaline ions vibrating in the negative charged interstitial position begins to act as oscillating dipole which is the basic condition for absorption of microwaves. The pre-heating may be effected for example by electrical heating what of course requires a hybrid furnace i.e. a furnace provided with combined electric and microwave heating which design is relatively costly and restrictive in capacity. Some authors have used for the preheating of transparent materials such as asbestos and kieselguhr various additives capable to absorb microwaves, for example powdered iron, iron trichloride, or borax (F.G. Wihsmann, R. Kokoschko, K. Forkel, "Glassmaker and Ceramicmaker " 46 75 (1996). However, such materials proved to be unsuitable as additives to glass materials since they react with the glass mass and undesirably change the glass composition and structure. Other authors used for the batch preheating a microwave absorbing envelop or they hydrated the material before its melting (M.P. Knox, Gl.J. Copley, "Glass technology" 38, 91 (1997). Neither these activating methods are perfect since by using a wave absorbing envelop the microwaves are hindered from penetrating into the batch and the heating is distributed by radiation as in the case of the classic heating processes. On the other hand with the majority of types of glass neither the hydration nor wetting provides sufficient means to warm up the batch to the temperature required.

According to EP-A1-0 349 405 micro waves are used for preheating or heating of materials such as oxides, glass and certain metals producing corrosive effect on the furnace lining when subjected to an induction heating. To enable preheating of materials that are not susceptible to micro waves glass containing iron oxides is added to the batch which oxide due to its high micro wave absorption provides for heating of the remaining micro-waves not susceptible materials. Nevertheless, such process is unacceptable for production of most of types of glass or natural materials based products since the iron oxide substantially affect the required qualities of final products.

The object of the invention is to provide a new method of heat treatment of glass materials and natural materials specifically of volcanic origin which enables melting, refining or hardening of such materials under specific conditions by applying the microwave technology in the full temperature range required and to all types of materials notwithstanding the composition or structure thereof.

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Another object of the invention is to provide an apparatus for performing said method operated in both the batch or continuous process.

Summary of the invention

In accordance with the foregoing the treated material is exposed to microwave radiation at frequency range from 1 MHz to 10 GHz and temperature range from the ambient temperature to 1800 °C in a batch or continuous production process.